

# Thinking Like an Economist

**M**uch of microeconomics entails the study of how people choose under conditions of scarcity. Many people react to this description by saying that the subject is of little real relevance in developed countries, where material scarcity is largely a thing of the past.

This reaction, however, takes too narrow a view of the Greek shipping magnate scarcity, for there are *always* important resources in short supply. At his death, Aristotle Onassis was worth several billion dollars. He had more money than he could possibly spend and used it for such things as finely crafted whale ivory footrests for the barstools on his yacht. And yet he confronted the problem of scarcity much more than most of us will ever have to. Onassis was the victim of *myasthenia gravis*, a debilitating and progressive neurological disease. For him, the scarcity that mattered was not money but time, energy, and the physical skill needed to carry out ordinary activities.

Time is a scarce resource for everyone, not just the terminally ill. In deciding which movies to see, for example, it is time, not the price of admission, that constrains most of us. With only a few free nights available each month, seeing one movie means not being able to see another, or not being able to have dinner with friends.

Time and money are not the only important scarce resources. Consider the economic choice you confront when a friend invites you to a buffet brunch. You must decide how to fill your plate. Even if you are not rich, money would be no object, since you can eat as much as you want for free. Nor is time an obstacle, since you have all afternoon and would enjoy spending it in the company of your friend. The important scarce resource here is the capacity of your stomach. A smorgasbord of your favorite foods lies before you, and you must decide which to eat and in what quantities. Eating another waffle necessarily means having less room for more scrambled eggs. The fact that no money changes hands here does not make your choice any less an economic one.

*Every* choice involves important elements of scarcity. Sometimes the most relevant scarcity will involve money, but not always. Coping with scarcity is the essence of the human condition. Indeed, were it not for the problem of scarcity, life would be stripped of much of its intensity. For someone with an infinite lifetime and limitless material resources, hardly a single decision would ever matter. If you made a bad decision today, you could always start with a clean slate tomorrow.

## LEARNING OBJECTIVES

After reading this chapter, you should be able to:

- LO1 Explain and apply the cost-benefit principle.
- LO2 Explain the uses and limitations of economic models.
- LO3 Describe the four common decision pitfalls.
- LO4 Translate quantitative information about costs and benefits into graphical form.
- LO5 Describe Adam Smith's invisible hand theory.
- LO6 Give several clear examples of how basic economic principles can be used to explain patterns of behavior observed in everyday life.
- LO7 Explain the difference between positive and normative theories.
- LO8 Explain the difference between microeconomics and macroeconomics.



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“Oh, it’s great here, all right, but I sort of feel uncomfortable in a place with no budget at all.”

In this chapter we examine some basic principles of microeconomic theory and see how an economist might apply them to a wide variety of choices involving scarcity. Later chapters more formally develop the theory. For now, our only goal is to get an intuitive feel for that distinctive mindset known as “thinking like an economist.” And the best way to do that is to work through a series of problems familiar from actual experience.

## THE COST-BENEFIT APPROACH TO DECISIONS

If the benefit of an activity exceeds its cost, do it.

Many of the choices economists study can be posed as the following question:

Should I do activity  $x$ ?

For the choice confronting a moviegoer, “. . . do activity  $x$ ?” might be, for example, “. . . see *Casablanca* tonight?” For the person attending the buffet brunch, it might be “. . . eat another waffle?” Economists answer such questions by comparing the costs and benefits of doing the activity in question. The decision rule we use is disarmingly simple. If  $C(x)$  denotes the costs of doing  $x$  and  $B(x)$  denotes the benefits, it is:

If  $B(x) > C(x)$ , do  $x$ ; otherwise don’t.

To apply this rule, we must define and measure costs and benefits. Monetary values are a useful common denominator for this purpose, even when the activity has nothing directly to do with money. We define  $B(x)$  as the maximum dollar amount you would be willing to pay to do  $x$ . Often  $B(x)$  will be a hypothetical magnitude, the amount you would be willing to pay if you had to, even though no money will change hands.  $C(x)$ , in turn, is the value of all the resources you must give up in order to do  $x$ . Here too  $C(x)$  need not involve an explicit transfer of money.

For most decisions, at least some of the benefits or costs will not be readily available in monetary terms. To see how we proceed in such cases, consider the following simple decision.

## Comparing Costs and Benefits

## EXAMPLE 1.1

**Should I turn down my stereo?**

You have settled into a comfortable chair and are listening to your stereo when you realize that the next two tracks on the disc are ones you dislike. If you had a programmable player, you would have programmed it not to play them. But you don't, and so you must decide whether to get up and turn the music down or stay put and wait it out.

The benefit of turning it down is not having the songs you don't like blare away at you. The cost, in turn, is the inconvenience of getting out of your chair. If you are extremely comfortable and the music is only mildly annoying, you will probably stay put. But if you haven't been settled for long or if the music is really bothersome, you are more likely to get up.

Even for simple decisions like this one, it is possible to translate the relevant costs and benefits into a monetary framework. Consider first the cost of getting out of your chair. If someone offered you 1 cent to get up out of a comfortable chair and there were no reason other than the penny to do it, would you take the offer? Most people would not. But if someone offered you \$1000, you would be on your feet in an instant. Somewhere between 1 cent and \$1000 lies your **reservation price**, the minimum amount it would take to get you out of the chair.

To see where the threshold lies, imagine a mental auction with yourself in which you keep boosting the offer by small increments from 1 cent until you reach the point at which it is barely worthwhile to get up. Where this point occurs will obviously depend on circumstance. If you are rich, it will tend to be higher than if you are poor, because a given amount of money will seem less important; if you feel energetic, it will be lower than if you feel tired; and so on. For the sake of discussion, suppose your reservation price for getting out of the chair turns out to be \$1. You can conduct a similar mental auction to determine the maximum sum you would be willing to pay someone to turn the music down. This reservation price measures the benefits of turning the music down; let's suppose it turns out to be 75 cents.

In terms of our formal decision rule, we then have  $x = \text{"turn my stereo down,"}$  with  $B(x) = \$0.75 < C(x) = \$1$ , which means that you should remain in your chair. Listening to the next two songs will be unpleasant, but less so than getting up

**reservation price of activity  $x$**  the price at which a person would be indifferent between doing  $x$  and not doing  $x$ .



"Blown-Away Man," Image by Steve Steigman.

Is it worth the trouble to turn down your stereo?

would be. A reversal of these cost and benefit figures would imply a decision to get up and turn the music down. If  $B(x)$  and  $C(x)$  happened to be equal, you would be indifferent between the two alternatives.

## THE ROLE OF ECONOMIC THEORY

The idea that anyone might actually calculate the costs and benefits of turning down a stereo may sound absurd. Economists have been criticized for making unrealistic assumptions about how people behave, and outsiders are quick to wonder what purpose is served by the image of a person trying to decide how much he would pay to avoid getting up from his chair.

There are two responses to this criticism. The first is that economists don't assume that people make such calculations explicitly. Rather, many economists argue, we can make useful predictions by assuming people act *as if* they made such calculations. This view was forcefully expressed by Nobel laureate Milton Friedman, who illustrated his point by looking at the techniques expert pool players use.<sup>1</sup> He argued that the shots they choose, and the specific ways they attempt to make them, can be predicted extremely well by assuming that players take careful account of all the relevant laws of Newtonian physics. Of course, few expert pool players have had formal training in physics, and hardly any can recite such laws as “the angle of incidence equals the angle of reflection.” Nor are they likely to know the definitions of “elastic collisions” and “angular momentum.” Even so, Friedman argued, they would never have become expert players in the first place *unless* they played as dictated by the laws of physics. Our theory of pool player behavior assumes, unrealistically, that players know the laws of physics. Friedman urged us to judge this theory not by how accurate its central assumption is but by how well it predicts behavior. And on this score, it performs very well indeed.

People don't always behave as predicted by economic models, but the models provide useful insights about how to achieve important goals.



Professional pool champion Corey Deuel may not know all the formal laws of Newtonian physics, but the quality of his play suggests that he has a deep understanding of them.

Like pool players, we must also develop skills for coping with our environments. Many economists, Friedman among them, believe that useful insights into our behavior can be gained by assuming that we act as if governed by the rules of rational decision making. By trial and error we eventually absorb these rules, just as pool players absorb the laws of physics.

A second response to the charge that economists make unrealistic assumptions is to concede that behavior does often differ from the predictions of economic models. Thus, as economist Richard Thaler puts it, we often behave more like novice than expert pool players—ignoring bank shots and having no idea about putting the proper spin on the cue ball to position it for the next shot. Considerable evidence supports this second view.

But even where economic models fail on descriptive grounds, they often provide useful guidance for decisions. That is, even if they don't always predict how we *do* behave, they may often give useful insights into how to achieve our

<sup>1</sup>Milton Friedman, “The Methodology of Positive Economics,” *Essays in Positive Economics*, Chicago: University of Chicago Press, 1953.

goals more efficiently. If novice pool players have not yet internalized the relevant physical laws, they may nonetheless consult those laws for guidance about how to improve. Economic models often play an analogous role with respect to ordinary consumer and business decisions. Indeed, this role alone provides a compelling reason for learning economics.

## COMMON PITFALLS IN DECISION MAKING

Some economists are embarrassed if an outsider points out that much of what they do boils down to an application of the principle that we should perform an action if and only if its benefits exceed its costs. That just doesn't sound like enough to keep a person with a PhD busy all day! There is more to it, however, than meets the eye. People who study economics quickly discover that measuring costs and benefits is as much an art as a science. Some costs seem almost deliberately hidden from view. Others may seem relevant but, on a closer look, turn out not to be.

Economics teaches us how to identify the costs and benefits that really matter. An important goal of this book is to teach you to become a better decision maker. A good starting point is to examine some common pitfalls in decision making. The relevant economic principles are simple and commonsensical, but many people ignore them.

### PITFALL I. IGNORING IMPLICIT COSTS

One pitfall is to overlook costs that are not explicit. If doing activity  $x$  means not being able to do activity  $y$ , then the value to you of doing  $y$  (had you done it) is an **opportunity cost** of doing  $x$ . Many people make bad decisions because they tend to ignore the value of such forgone opportunities. This insight suggests that it will almost always be instructive to translate questions such as "Should I do  $x$ ?" into ones such as "Should I do  $x$  or  $y$ ?" In the latter question,  $y$  is simply the most highly valued alternative to doing  $x$ . Example 1.2 helps drive this important point home.

**opportunity cost of activity**  
the value of all that must be sacrificed to do the activity.

#### Implicit Cost

#### EXAMPLE 1.2

##### *Should I go skiing today or work as a research assistant?*

There is a ski area near your campus. From experience you know that a day on the slopes is worth \$60 to you. The charge for the day is \$40 (which includes bus fare, lift ticket, and equipment). However, this is not the only cost of going skiing. You must also take into account the value of the most attractive alternative you will forgo by heading for the slopes. Suppose the best alternative is your new job as a professor's research assistant. The job pays \$45 per day, and you like it just well enough to be willing to do it for free. The question you face is, "Should I go skiing or work as a research assistant?"

Here the cost of skiing is not just the explicit cost of the ski package (\$40) but also the opportunity cost of the lost earnings (\$45). The total costs are therefore \$85, which exceeds the benefits of \$60. Since  $C(x) > B(x)$ , you should stay on campus and work for your professor. Someone who ignored the opportunity cost of the forgone earnings would decide incorrectly to go skiing.

The fact that you liked the research job just well enough to have been willing to do it for free is another way of saying there were no psychic costs associated with doing it. This is important because it means that by not doing the job you would not have been escaping something unpleasant. Of course, not all jobs fall into this category. Suppose instead that your job is to scrape plates in the dining hall for the same pay, \$45/day, and that the job is so unpleasant that you would be unwilling to do it for less than \$30/day. Assuming your manager at the dining hall permits you to take a day off whenever you want, let's now reconsider your decision about whether to go skiing.

### EXAMPLE 1.3

#### Costs and Benefits Are Reciprocal

##### *Should I go skiing today or scrape plates?*

There are two equivalent ways of looking at this decision. One is to say that one benefit of going skiing is not having to scrape plates. Since you would never be willing to scrape plates for less than \$30/day, avoiding that task is worth that amount to you. Going skiing thus carries the indirect benefit of not scraping plates. When we add that indirect benefit to the \$60 direct benefit of the skiing, we get  $B(x) = \$90$ . In this view of the problem,  $C(x)$  is the same as before, namely, the \$40 ski charge plus the \$45 opportunity cost of the lost earnings, or \$85. So now  $B(x) > C(x)$ , which means you should go skiing.

Alternatively, we could have viewed the unpleasantness of the plate-scraping job as an offset against its salary. By this approach, we would subtract \$30/day from your \$45/day earnings and say that the opportunity cost of not working is only \$15/day. Then  $C(x) = \$40 + \$15 = \$55 < B(x) = \$60$ , and again the conclusion is that you should go skiing.

It makes no difference in which of these two ways you handle the valuation of the unpleasantness of scraping plates. It is critically important, however, that you do it either one way or the other. Don't count it twice!

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As Example 1.3 makes clear, costs and benefits are reciprocal. Not incurring a cost is the same as getting a benefit. By the same token, not getting a benefit is the same as incurring a cost.

Obvious as this sounds, it is often overlooked. A case in point was a foreign graduate student who got his degree some years ago and was about to return to his home country. The trade regulations of his nation permitted people returning from abroad to bring back a new automobile without having to pay the normal 50 percent tariff. The student's father-in-law asked him to bring him back a new \$20,000 Chevrolet and sent him a check for exactly that amount. This put the student in a quandary. He had been planning to bring back a Chevrolet and sell it in his home country. Because, as noted, new cars normally face a 50 percent import tax, such a car would sell at a dealership there for \$30,000. The student estimated that he could easily sell it privately for \$28,000, which would net him an \$8000 gain. Thus the opportunity cost of giving the car to his father-in-law for \$20,000 was going to be \$8000! Not getting this big benefit was a big cost. In the end, it was one the student elected to bear because he valued keeping peace in the family even more. As the cost-benefit principle makes clear, the best decision is not always the one that leaves you with the most money in your pocket.

## Opportunity Cost

## EXAMPLE 1.4

**Should I work first or go to college first?**

College costs are not limited to tuition, fees, housing, food, books, supplies, and the like. They also include the opportunity cost of earnings forgone while studying. Earnings increase with experience. Thus the more experience you have, the more you must forgo to attend college. This opportunity cost is therefore lowest when you are right out of high school.

On the benefit side, one big gain of a college education is sharply higher earnings. The sooner you graduate, the longer you will reap this benefit. Another benefit is the pleasantness of going to college as opposed to working. In general, the kinds of jobs people hold tend to be less unpleasant (or more pleasant) the more education they have. By going to college right away, you thus avoid having to work at the least pleasant jobs. For most people, then, it makes sense to go to college first and work afterward. Certainly it makes more sense to attend college at age 20 than at age 50.

A common exception involves people who are too immature right out of high school to reap the benefits of college work, who often do better by working a year or two before college.



Why do most students start college right after finishing high school?

Example 1.4 is a perfect illustration of Friedman's argument about how to evaluate a theory. High school seniors don't decide when to attend college on the basis of sophisticated calculations involving opportunity costs. On the contrary, most start right out of high school simply because that is what most of their peers do. It is the thing to do.

But this begs the question of how it got to *be* the thing to do. Customs do not originate out of thin air. A host of different societies have had centuries to experiment with this decision. If there were a significantly better way of arranging the learning and working periods of life, some society should have long since discovered it. Our current custom has survived because it is efficient. People may not make explicit calculations about the opportunity cost of forgone earnings, but they often behave *as if* they do.<sup>2</sup>

As simple as the opportunity cost concept is, it is one of the most important in microeconomics. The art in applying the concept correctly lies in being able to recognize the most valuable alternative that is sacrificed by the pursuit of a given activity.

## PITFALL 2. FAILING TO IGNORE SUNK COSTS

An opportunity cost may not seem to be a relevant cost when in reality it is. On the other hand, sometimes an expenditure may seem relevant when in reality it is not. Such is often the case with *sunk costs*, costs that are beyond recovery at the moment a decision is made. Unlike opportunity costs, these costs *should be* ignored. Not ignoring them is a second pitfall in decision making. The principle of ignoring sunk costs emerges clearly in the following example.

<sup>2</sup>This does not mean that all customs necessarily promote efficiency. For example, circumstances may have changed in such a way that a custom that promoted efficiency in the past no longer does so. In time, such a custom might change. Yet many habits and customs, once firmly entrenched, are very slow to change.

**EXAMPLE 1.5****Sunk Cost (Part 1)*****Should I drive to Boston or take the bus?***

You are planning a 250-mile trip to Boston. Except for the cost, you are completely indifferent between driving and taking the bus. Bus fare is \$100. You don't know how much it would cost to drive your car, so you call Hertz for an estimate. Hertz tells you that for your make of car the costs of a typical 10,000-mile driving year are as follows:

If a cost has already been incurred and cannot be recovered, it is irrelevant for all decisions about the future.

Insurance	\$1000
Interest	2000
Fuel & Oil	1000
Maintenance	<u>1000</u>
Total	\$5000

Suppose you calculate that these costs come to \$0.50/mile and use this figure to compute that the 250-mile trip will cost you \$125 by car. And since this is more than the \$100 bus fare, you decide to take the bus.

If you decide in this fashion, you fall victim to the sunk cost pitfall. Insurance and interest payments do not vary with the number of miles you drive each year. Both are sunk costs and will be the same whether or not you drive to Boston. Of the costs listed, fuel and oil and maintenance are the only ones that vary with miles driven. These come to \$2000 for each 10,000 miles you drive, or \$0.20/mile. At \$0.20/mile, it costs you only \$50 to drive to Boston, and since this is less than the bus fare, you should drive.

In Example 1.5, note the role of the assumption that, costs aside, you are indifferent between the two modes of transport. If you had preferred one mode to the other, we would also have had to weigh that preference. For example, if you were willing to pay \$60 to avoid the hassle of driving, the real cost of driving would be \$110, not \$50, and you should take the bus.

Exercises such as the one below are sprinkled throughout the text to help you make sure that you understand important analytical concepts. You will master microeconomics more effectively if you do these exercises as you go along.

**CONCEPT CHECK 1.1**

How, if at all, would your answer to the question in Example 1.5 be different if the worth of avoiding the hassle of driving is \$20 and you average one \$28 traffic ticket for every 200 miles you drive?

As a check, the answers to the in-chapter exercises are at the end of each chapter. Naturally, the exercises will be much more useful if you work through them before consulting the answers.

**EXAMPLE 1.6****Sunk Cost (Part 2)*****The pizza experiment.***

A local pizza parlor offers an all-you-can-eat lunch for \$5. You pay at the door, then the waiter brings you as many slices of pizza as you like. A former colleague performed this experiment: An assistant served as the waiter for one group of



tables.<sup>3</sup> The “waiter” selected half the tables at random and gave everyone at those tables a \$5 refund before taking orders. Diners at the remaining tables got no refund. He then kept careful count of the number of slices of pizza each diner ate. What difference, if any, do you predict in the amounts eaten by these two groups?

Diners in each group confront the question “Should I eat another slice of pizza?” Here, the activity  $x$  consists of eating one more slice. For both groups,  $C(x)$  is exactly zero: Even members of the group that did not get a refund can get as many additional slices as they want at no extra charge. Because the refund group was chosen at random, there is no reason to suppose that its members like pizza any more or less than the others. For everyone, the decision rule says keep eating until there is no longer any extra pleasure in eating another slice. Thus,  $B(x)$  should be the same for each group, and people from both groups should keep eating until  $B(x)$  falls to zero.

By this reasoning, the two groups should eat the same amount of pizza, on the average. The \$5 admission fee is a sunk cost and should have no influence on the amount of pizza one eats. *In fact, however, the group that did not get the refund consumed substantially more pizza.*

Eating additional food just to get your money’s worth is not a sensible decision strategy.

Although our cost-benefit decision rule fails the test of prediction in this experiment, its message for the rational decision maker stands unchallenged. The two groups logically *should* have behaved the same. The only difference between them, after all, is that patrons in the refund group have lifetime incomes that are \$5 higher than the others.<sup>4</sup> Such a trivial difference should have no effect on pizza consumption. Members of the no-refund group seemed to want to make sure they “got their money’s worth.” In all likelihood, however, this motive merely led them to overeat.<sup>4</sup>

What’s wrong with being motivated to “get your money’s worth”? Absolutely nothing, as long as the force of this motive operates *before* you enter into transactions. Thus it makes perfectly good sense to be led by this motive to choose one restaurant over an otherwise identical competitor that happens to cost more. Once the price of your lunch has been determined, however, the get-your-money’s-worth motive should be abandoned. The satisfaction you get from eating another slice of pizza should then depend only on how hungry you are and on how much you like pizza, not on how much you paid. Yet people often seem not to behave in this fashion. The difficulty may be that we are not creatures of complete flexibility. Perhaps motives that make sense in one context are not easily abandoned in another.

### CONCEPT CHECK 1.2

Jim wins a ticket from a radio station to see a jazz band perform at an outdoor concert. Mike has paid \$18 for a ticket to the same concert. On the evening of the concert there is a tremendous thunderstorm. If Jim and Mike have the same tastes, which of them will be more likely to attend the concert, assuming that each decides on the basis of a standard cost-benefit comparison?

## PITFALL 3. MEASURING COSTS AND BENEFITS AS PROPORTIONS RATHER THAN ABSOLUTE DOLLAR AMOUNTS

When a boy asks his mother “Are we almost there yet?” how will she answer if they are 10 miles from their destination? Without some knowledge of the context of their journey, we cannot say. If they are near the end of a 300-mile journey, her

<sup>3</sup>See Richard Thaler, “Toward a Positive Theory of Consumer Choice,” *Journal of Economic Behavior and Organization* 1, 1980.

<sup>4</sup>An alternative to the “get-your-money’s-worth” explanation is that \$5 is a significant fraction of the amount of cash many diners have available to spend *in the short run*. Thus members of the refund group might have held back in order to save room for the dessert they could now afford to buy. To test this alternative explanation, the experimenter could give members of the no-refund group a \$5 cash gift earlier in the day and then see if the amount of pizza consumed by the two groups still differed.

answer will almost surely be yes. But if they have just embarked on a 12-mile journey, she will say no.

Contextual clues are important for a variety of ordinary judgments. Thinking about distance as a percentage of the total amount to be traveled is natural and informative. Many also find it natural to think in percentage terms when comparing costs and benefits. But as the following pair of simple examples illustrates, this tendency often causes trouble.

**EXAMPLE 1.7****Comparing Costs and Benefits (Part 1)*****Should you drive to Walmart to save \$10 on a \$20 clock radio?***

You are about to buy a clock radio at the nearby campus store for \$20 when a friend tells you that the very same radio is on sale at Walmart for only \$10. If Walmart is a 15-minute drive away, where would you buy the radio? (If it fails under warranty, you must send it to the manufacturer for repairs, no matter where you bought it.)

**EXAMPLE 1.8****Comparing Costs and Benefits (Part 2)*****Should you drive downtown to save \$10 on a \$1000 television set?***

You are about to buy a new television set at the nearby campus store for \$1010 when a friend tells you that the very same set is on sale at Walmart for only \$1000. If Walmart is a 15-minute drive away, where would you buy the television? (Again, repairs under warranty would entail sending the set to the manufacturer in each case.)

There is no uniquely correct answer to either of these questions, both of which ask whether the benefit of driving to Walmart is worth the cost. Most people say the trip would definitely be worth making for the clock radio, but definitely not worth making for the television. When pressed to explain, they say driving yields a 50-percent savings on the radio but only a 1-percent savings on the television.

These percentages, however, are irrelevant. In each case the benefit of driving to Walmart is exactly the \$10 savings from the lower purchase price. What's the cost of driving to Walmart? Some might be willing to make the drive for as little as \$5, while others might not be willing to do it for less than \$50. But whatever the number, it should be the same in both cases. So your answers to the questions just posed should be the same. If you would be willing to make the drive for, say, \$8, then you should buy both the clock radio and the television at Walmart. But if your reservation price for making the drive is, say, \$12, then you should buy both appliances at the nearby campus store.

When using the cost-benefit test, you should express costs and benefits in absolute dollar terms. Comparing percentages is not a fruitful way to think about decisions like these.

**CONCEPT CHECK 1.3**

You are holding a discount coupon that will entitle you to a fare reduction on only one of the two trips you are scheduled to take during the coming month. You can get \$100 off the normal \$200 airfare to New York City, or you can get \$120 off the normal \$2400 airfare to New Delhi. On which trip should you use your coupon?

**PITFALL 4. FAILURE TO UNDERSTAND THE AVERAGE-MARGINAL DISTINCTION**

So far we've looked at decisions about whether to perform a given action. Often, however, the choice is not whether to perform the action but the extent to which it should be performed. In this more complex case, we can apply the cost-benefit

When comparing costs and benefits, always use absolute dollar amounts, not proportions.

principle by reformulating the question. Instead of asking “Should I do activity  $x$ ?” we repeatedly pose the question “Should I increase the level by which I am currently engaging in activity  $x$ ?”

To answer this question, we must compare the benefit and cost of an *additional* unit of activity. The cost of an additional unit of activity is called the **marginal cost** of the activity, and the benefit of an additional unit is called its **marginal benefit**.

The cost-benefit rule tells us to keep increasing the level of an activity as long as its marginal benefit exceeds its marginal cost. But as Example 1.9 illustrates, people often fail to apply this rule correctly.

**marginal cost** the increase in total cost that results from carrying out one additional unit of an activity.

**marginal benefit** the increase in total benefit that results from carrying out one additional unit of an activity.

### Marginal Cost and Benefit vs. Average Cost and Benefit

### EXAMPLE 1.9

#### Should Tom launch another boat?

Tom manages a small fishing fleet of three boats. His current daily cost of operations, including boat rentals and fishermen’s wages, is \$300, or an average of \$100 per boat launched. His daily total revenue, or benefit, from the sale of fish is currently \$600, or an average of \$200 per boat launched. Tom decides that since his cost per boat is less than his revenue per boat, he should launch another boat. Is this a sound decision?

To answer this question, we must compare the marginal cost of launching a boat with its marginal benefit. The information given, however, tell us only the **average cost** and **average benefit** of launching a boat—which are, respectively, one-third of the total cost of three boats and one-third of the total revenue from three boats. Knowing the average benefit and average cost per boat launched does not enable us to decide whether launching another boat makes economic sense. For although the average benefit of the three boats launched thus far *might* be the same as the marginal benefit of launching another boat, it might also be either higher or lower. The same statement holds true regarding average and marginal costs.

To illustrate, suppose the marginal cost of launching a boat and crew is constant at \$100 per boat per day. Then Tom should launch a fourth boat only if doing so will add at least \$100 in daily revenue from his total fish catch. The mere fact that the current average revenue is \$200 per boat simply doesn’t tell us what the marginal benefit of launching the fourth boat will be.

Suppose, for example, that the relationship between the number of boats launched and the daily total revenue is as described in Table 1.1. With three boats per day, the average benefit per boat would then be \$200, just as indicated above. If Tom launched a fourth boat, the *average* daily revenue would fall to \$160 per boat, which is still more than the assumed marginal cost of \$100. Note, however, that in the second column the total revenue from four boats is only \$40 per day more than the total revenue from three boats. That means that the marginal revenue from launching the fourth boat is only \$40. And since that is less than its marginal cost (\$100), launching the fourth boat makes no sense.

**average cost** the average cost of undertaking  $n$  units of an activity is the total cost of the activity divided by  $n$ .

**average benefit** the average benefit of undertaking  $n$  units of an activity is the total benefit of the activity divided by  $n$ .

**TABLE 1.1**

**How Total Cost Varies with the Number of Boats Launched**

Number of boats	Daily total benefit (\$)	Daily average benefit (\$/boat)
0	0	0
1	300	300
2	480	240
3	600	200
4	640	160

Example 1.10 illustrates how to apply the cost-benefit principle correctly in this case.

**EXAMPLE 1.10****Applying the Cost-Benefit Principle*****How many boats should Tom launch?***

The marginal cost of launching a boat and crew is again constant at \$100 per day. If total daily revenue from the catch again varies with the number of boats launched as shown in Table 1.1, how many boats should Tom launch?

Tom should keep launching boats as long as the marginal benefit of doing so is at least as great as the marginal cost. With marginal cost constant at \$100 per launch, Tom should thus keep launching boats as long as the marginal benefit is at least \$100.

Applying the definition of marginal benefit to the total benefit entries in the second column of Table 1.1 yields the marginal benefit values in the third column of Table 1.2. (Because marginal benefit is the change in total benefit that results when we change the number of boats by one, we place each marginal benefit entry midway between the rows showing the corresponding total benefit entries.) For example, the marginal benefit of increasing the number of boats from one to two is \$180, the difference between the \$480 total revenue with two boats and the \$300 with one.

**TABLE 1.2**  
**How Marginal Benefit Varies with the Number of Boats Launched**

Number of boats	Daily total benefit (\$)	Daily marginal benefit (\$/boat)
0	0	
		300
1	300	
		180
2	480	
		120
3	600	
		40
4	640	

Comparing the \$100 marginal cost per boat with the marginal benefit entries in the third column of Table 1.2, we see that the first three launches satisfy the cost-benefit test, but the fourth does not. Tom should thus launch three boats.

**CONCEPT CHECK 1.4**

If the marginal cost of launching each boat had not been \$100 but \$150, how many boats should Tom have launched?

The cost-benefit principle tells us that *marginal* costs and benefits—measures that correspond to the *increment* of an activity under consideration—are the relevant ones for choosing the level at which to pursue the activity. Yet many people compare the *average* cost and benefit of the activity when making such decisions. As Example 1.9 should have made clear, however, increasing the level of an activity may not be justified, even though its average benefit at the current level is significantly greater than its average cost.

## USING MARGINAL BENEFIT AND MARGINAL COST GRAPHICALLY

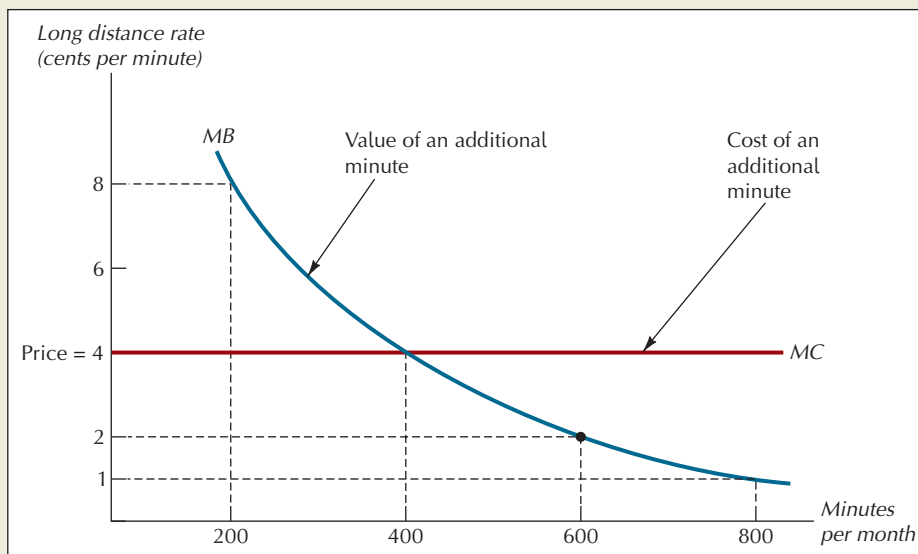
The examples just discussed entail decisions about an activity that could take place only on specific levels—no boats, one boat, two boats, and so on. The levels of many other activities, however, can vary continuously. One can buy gasoline, for example, in any quantity one wishes. For activities that are continuously variable, it is often convenient to display the comparison of marginal benefit and marginal cost graphically.

### Comparing Marginal Benefit and Cost Graphically

### EXAMPLE 1.1

#### How much should Susan talk to Hal each month?

Susan has a telephone plan for which the charge is 4 cents per minute for a long-distance call to her boyfriend Hal. (Fractional minutes are billed at the same rate, so a 30-second call would cost her 2 cents.) The value to Susan, measured in terms of her willingness to pay, of an additional minute of conversation with Hal is shown on curve *MB* in Figure 1.1. How many minutes should she spend on the phone with Hal each month?



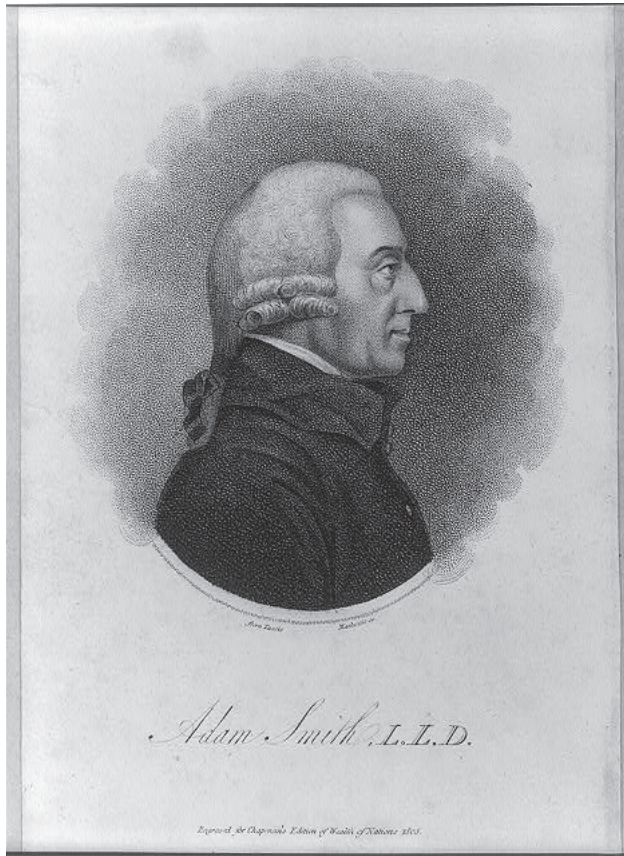
**FIGURE 1.1**  
**The Optimal Quantity of Conversation.**

The optimal amount of a continuously variable activity is the quantity for which its marginal benefit is just equal to its marginal cost.

The downward slope of curve *MB* reflects the fact that the value of an additional minute declines with the total amount of conversation that has occurred thus far. (As we will see in Chapter 3, it is a common pattern that the more someone has of a good, the less value he assigns to having additional units of it.) Curve *MC* in the diagram measures the cost of each additional minute, assumed to be constant at \$0.04. The optimal quantity of conversation is the quantity for which these two curves cross—namely, 400 minutes per month. If Susan speaks with Hal for less than that amount, the marginal benefit from adding another minute would exceed the marginal cost, so she should talk longer. But if they speak for more than 400 minutes per month, the amount she would save by speaking less would exceed the benefit she would sacrifice, which means they should speak less.

#### CONCEPT CHECK 1.5

If her marginal benefit curve is again as given in Figure 1.1, how many minutes should Susan speak with Hal each month if the long-distance rate falls to 2 cents per minute?



Adam Smith: 1723–1790. Smith's modern disciples often oversimplify his message.

## THE INVISIBLE HAND

One of the most important insights of economic analysis is that the individual pursuit of self-interest is often not only *consistent* with broader social objectives, but actually even *required* by them. Wholly unaware of the effects of their actions, self-interested consumers often act as if driven by what Adam Smith called an *invisible hand* to produce the greatest social good. In perhaps the most widely quoted passage from *The Wealth of Nations*, Smith wrote:

It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard of their own interest. We address ourselves not to their humanity, but to their self-love, and never talk to them of our necessities, but of their advantage.

Smith observed that competition among sellers fostered attempts to develop better products and cheaper ways of producing them. The first to succeed in those attempts enjoyed higher profits than their rivals, but only temporarily. As others copied the new products and methods, their offerings put inevitable downward pressure on prices. Smith's insight, in a nutshell, was that although sellers were seeking only to promote their own advantage, the ultimate beneficiaries were consumers.

Modern economists sometimes lose sight of the fact that Smith did not believe that *only* selfish motives are important. In his earlier treatise, *The Theory of Moral Sentiments*, for example, he wrote movingly about the compassion we feel for others:

How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it. Of this kind is pity or compassion, the emotion which we feel for the misery of others, when we either see it, or are made to conceive it in a very lively manner. That we often derive sorrow from the sorrow of others, is a matter of fact too obvious to require any instances to prove it; for this sentiment, like all the other original passions of human nature, is by no means confined to the virtuous and humane, though they perhaps may feel it with the most exquisite sensibility. The greatest ruffian, the most hardened violator of the laws of society, is not altogether without it.

Smith was well aware, moreover, that the outcome of unbridled pursuit of self-interest is sometimes far from socially benign. As the following example illustrates, the invisible hand mechanism breaks down when important costs or benefits accrue to people other than the decision makers themselves.

### EXAMPLE I.12

#### Applying Marginal Benefit and Cost Graphically

##### *Should I burn my leaves or haul them into the woods?*

Suppose the cost of hauling the leaves is \$20 and the cost to the homeowner of burning them is only \$1. If the homeowner cares only about costs that accrue

directly to herself, she will burn her leaves. The difficulty is that burning leaves also entails an important **external cost**, which means a cost borne by people who are not directly involved in the decision. This external cost is the damage done by the smoke from the fire. That cost accrues not to the homeowner who makes the decision about burning the leaves but to the people downwind. Suppose the smoke damage amounts to \$25. The good of the community then requires that the leaves be hauled, not burned. From the perspective of the self-interested homeowner, however, it seems best to burn them.<sup>5</sup>

**external cost of an activity**  
a cost that falls on people who are not directly involved in the activity.

External costs and benefits often motivate laws that limit individual discretion. (External costs and benefits will be our focus in Chapter 16.) Most communities, for example, now have laws prohibiting the burning of leaves within city limits. Such laws may be viewed as a way of making the costs and benefits seen by individuals more nearly resemble those experienced by the community as a whole. With a law against burning leaves in effect, the potential leaf burner weighs the penalty of breaking the law against the cost of hauling the leaves. Most people conclude it is cheaper to haul them.

## WOULD PARENTS WANT THEIR DAUGHTER OR SON TO MARRY *HOMO ECONOMICUS*? \_\_\_\_\_

Many economists and other behavioral scientists remain skeptical about the importance of duty and other unselfish motives. They feel that the larger material payoffs associated with selfish behavior so strongly dominate other motives that, as a first approximation, we may safely ignore nonegoistic motives.

With this view in mind, the stereotypical decision maker in the self-interest model is often given the label *Homo economicus*, or “economic man.” *Homo economicus* does not experience the sorts of sentiments that motivate people to vote, or to return lost wallets to their owners with the cash intact. On the contrary, personal material costs and benefits are the only things he cares about. He does not contribute voluntarily to private charities or public television stations, keeps promises only when it pays to do so, and if the pollution laws are not carefully enforced, disconnects the catalytic converter on his car to save on fuel. And so on.

Obviously, many people do not fit the me-first caricature of the self-interest model. They donate bone marrow to strangers with leukemia. They endure great trouble and expense to see justice done, even when it will not undo the original injury. At great risk to themselves, they pull people from burning buildings and jump into icy rivers to rescue people who are about to drown. Soldiers throw their bodies atop live grenades to save their comrades.

To be sure, selfish motives are important. When a detective investigates a murder, for example, her first question is, “Who stood to benefit from the victim’s death?” When an economist studies a government regulation, he wants to know whose incomes it enhances. When a senator proposes a new spending project, the political scientist tries to discover which of his constituents will be its primary beneficiaries.

Self-interest is one of the most important human motives. But it is not the only important motive.

<sup>5</sup>Of course, if the homeowner interacts frequently with the people downwind, self-interest may still dictate hauling the leaves, to preserve goodwill for future interactions. But where the people downwind are anonymous strangers, this motive will operate with less force.

Our goal in much of this text is to understand the kinds of behaviors to which selfish motives give rise in specific situations. But throughout this process, it is critical to remember that the self-interest model is not intended as a prescription for how to conduct your own affairs. On the contrary, we will see in later chapters that *Homo economicus* is woefully ill suited to the demands of social existence as we know it. Each of us probably knows people who more or less fit the *Homo economicus* caricature. And our first priority, most of the time, is to steer clear of them.

The irony here is that being a purely self-interested person entails a degree of social isolation that is not only bad for the soul but also harmful to the pocket-book. To succeed in life, even in purely material terms, people must form alliances and relationships of trust. But what sensible person would be willing to trust *Homo economicus*? Later chapters present specific examples of how unselfish motives confer material rewards on those who hold them. For the present, however, bear in mind that the self-interest model is intended only to capture one part of human behavior, albeit an important one.

## THE ECONOMIC NATURALIST

Studying biology enables people to observe and marvel at many details of life that would otherwise escape them. For the naturalist, a walk in a quiet woods becomes an adventure. In much the same way, studying microeconomics enables someone to become an “economic naturalist,” a person who sees the mundane details of ordinary existence in a sharp new light. Each feature of the manmade landscape is no



### Economic Naturalist I.1

#### Why is airline food so bad?



Everyone complains about airline food. Indeed, if any serious restaurant dared to serve such food, it would quickly go bankrupt. Our complaints seem to take for granted that airline meals should be just as good as the ones we eat in restaurants. But why should they? The cost-benefit perspective says that airlines should increase the quality of their meals if and only if the benefit would outweigh the cost. The benefit of better food is probably well measured by what passengers would be willing to pay for it, in the form of higher ticket prices. If a restaurant-quality meal could be had for, say, a mere \$10 increase in fares, most people would probably be delighted to pay it. The difficulty, however, is that it would be much more costly than that to prepare significantly better meals at 39,000 feet in a tiny galley with virtually no time. It could be done, of course. An airline could remove 20 seats from the plane, install a modern, well-equipped kitchen, hire extra staff, spend more on ingredients, and so on. But these extra costs would be more like \$100 per passenger than \$10. For all our complaints about the low quality of airline food, few of us would be willing to bear this extra burden. In fact, in recent years, many airlines have eliminated meals from many flights or offer meals only for purchase, to lower operating costs. The sad result is that airline food is destined to remain unpalatable.



longer an amorphous mass but the result of an implicit cost-benefit calculation. Following are some examples of economic naturalism.

Many of us respond warmly to the maxim “Anything worth doing is worth doing well.” After all, it encourages a certain pride of workmanship that is often sadly lacking. Economic Naturalist 1.1 makes clear, however, that if the maxim is interpreted literally, it does not make any sense. To do something well requires time, effort, and expense. But these are scarce resources. To devote them to one activity makes them unavailable for another. Increasing the quality of one of the things we do thus necessarily means to reduce the quality of others—yet another application of the concept of opportunity cost. Every intelligent decision must be mindful of this trade-off.

Everything we see in life is the result of some such compromise. For Novak Djokovic, playing championship tennis rules out becoming a concert pianist. Yet this obviously does not mean he shouldn’t spend any time playing the piano. It just means that he should hold himself to a lower standard there than in the tennis arena.



The time and effort required to become a championship tennis player rule out the possibility of simultaneously becoming a leading concert pianist.

## Economic Naturalist 1.2



### ***Why do many manual transmissions have six forward speeds, many automatics only four?***

The more forward speeds a car’s transmission has, the better its fuel economy will be. The additional gears act like the “overdrive” of cars of the 1940s, conserving fuel by allowing cars to cruise at highway speeds at lower engine speeds. Most cars in current production offer five or six forward speeds on their manual transmissions, only three or four on their automatics. Since fuel economy is obviously a good thing, why limit the number of speeds on automatics?

The reason is that fuel economy is not our only objective. We also want to keep the price of the car within limits. Automatic transmissions are more complex than manual ones, and the cost of adding an extra speed is accordingly much greater in automatics. The benefits of adding an extra speed, by contrast, are the same in both cases. If carmakers follow the rule “Add an extra speed if its benefit outweighs its cost,” then automatics will have fewer speeds than manuals.

The reasoning in Economic Naturalist 1.2 also helps make clear why many manual transmissions now have six forward speeds when 50 years ago most had only three (and many automatic transmissions only two). The benefit of adding an extra speed, again, is that it increases fuel economy. The value of this benefit, in dollar terms, thus depends directly on the price of fuel. The price of gasoline relative to other goods is much higher than it was 50 years ago, which helps explain why transmissions have more speeds than they used to.

## POSITIVE QUESTIONS AND NORMATIVE QUESTIONS

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**normative question** a question about what policies or institutional arrangements lead to the best outcomes.

**positive question** a question about the consequences of specific policies or institutional arrangements.

In the Pacific Northwest, logging companies are currently cutting down the few remaining stands of virgin redwoods to supply contractors with timber to build homes. Many of these trees are more than 2000 years old, a national treasure we can never hope to replace. To the logging companies, however, they are worth more as lumber than as monuments to the past. Whether the remaining stands of virgin redwoods ought to be protected is in the end a **normative question**—a question involving our values. A normative question is a question about what *ought* to be or *should* be. By itself, economic analysis cannot answer such questions. A society that reveres nature and antiquity may well decide the fate of the redwoods differently from one that holds other values, even though members of both societies are in complete agreement about all the relevant economic facts and theories. Economic analysis is on firmer ground when it comes to answering **positive questions**—questions about what the consequences of specific policies or institutional arrangements will be. If we ban the cutting of virgin redwoods, what will happen to the price of lumber? What substitute building materials are likely to be developed, and at what cost? How will employment in the logging and housing industries be affected? These are all positive economic questions, and the answers to them are clearly relevant to our thinking about the underlying normative question.

## MICROECONOMICS AND MACROECONOMICS

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Our focus in this chapter is on issues confronting the individual decision maker. As we proceed, we'll also consider economic models of groups of individuals—for example, the group of all buyers or all sellers in a market. The study of individual choices and the study of group behavior in individual markets both come under the rubric of microeconomics. Macroeconomics, by contrast, is the study of broader aggregations of markets. For example, it tries to explain the national unemployment rate, the overall price level, and the total value of national output.

Economists are much better at predicting and explaining what happens in individual markets than in the economy as a whole. When prominent economists disagree in the press or on television, the issue is more likely to be from macroeconomics than from microeconomics. But even though economists still have trouble with macroeconomic questions, macroeconomic analysis is undeniably important. After all, recessions and inflation disrupt millions of lives.

Economists increasingly believe that the key to progress in macroeconomics lies in more careful analysis of the individual markets that make up broader aggregates. As a result, the distinction between micro and macro has become less clear in recent years. The graduate training of all economists, micro and macro alike, is increasingly focused on microeconomic analysis.

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### ■ SUMMARY ■

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- Microeconomics entails the study of choice under scarcity. Scarcity is ever present, even when material resources are abundant. There are always important limitations on time, energy, and the other things we need to pursue our goals.
- Much of the economist's task is to try to answer questions of the form "Should I do activity  $x$ ?" The approach to answering them is disarmingly simple. It is to do  $x$  if and only if its costs are smaller than its benefits. Not incurring a cost is the same as getting a benefit. (LO1)
- The cost-benefit model sometimes fails to predict how people behave when confronted with everyday choices. The art of cost-benefit analysis lies in being

able to specify and measure the relevant costs and benefits, a skill many decision makers lack. Some costs, such as sunk costs, often seem relevant but turn out not to be. Others, such as implicit costs, are sometimes ignored, even though they are important. Benefits too are often difficult to measure. Experience has taught that becoming aware of the most common pitfalls helps most people become better decision makers. (LO2, LO3)

- When the question is not whether to perform an activity but rather at what level to perform it, marginal analysis draws our attention to the importance of

marginal benefits and marginal costs. We should increase the level of an activity whenever its marginal benefit exceeds its marginal cost. (LO1)

- The principles of rational choice are by no means limited to formal markets for goods and services. Indeed, some form of implicit or explicit cost-benefit calculation lies behind almost every human action, object, and behavior. Knowledge of the underlying principles casts our world in a sharp new light, not always flattering, but ever a source of stimulating insight. (LO6)

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## ■ REVIEW QUESTIONS ■

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1. What is your opportunity cost of reading a novel this evening? (LO3)
2. Your roommate is thinking of permanently dropping out of school this semester. If his tuition payment for this semester is non-refundable, should he take it into account when making his decision? (LO3)
3. Give three examples of activities accompanied by external costs or benefits. (LO5)
4. Why is the opportunity cost of attending college higher for a 50-year-old than for a 20-year-old? (LO6)
5. Why should sunk costs be irrelevant for current decisions? (LO3)
6. How can the cost-benefit model be useful for studying the behavior of people who do not think explicitly in terms of costs and benefits? (LO2)

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## ■ PROBLEMS ■

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1. Jamal has a flexible summer job. He can work every day but is allowed to take a day off anytime he wants. His friend Don suggests they go to the amusement park on Tuesday. The admission charge for the park is \$15 per person, and it will cost them \$5 each for gasoline and parking. Jamal loves amusement parks and a day at the park is worth \$45 to him. However, Jamal also enjoys his job so much that he would actually be willing to pay \$10 per day to do it. (LO1)
  - a. If Jamal earns \$10 if he works, should he go to the amusement park?
  - b. If Jamal earns \$15 . . . ?
  - c. If Jamal earns \$20 . . . ?
2. Tom is a mushroom farmer. He invests all his spare cash in additional mushrooms, which grow on otherwise useless land behind his barn. The mushrooms double in size during their first year, after which time they are harvested and sold at a constant price per pound. Tom's friend Dick asks Tom for a loan of \$200, which he promises to repay after 1 year. How much interest will Dick have to pay Tom in order for Tom to be no worse off than if he had not made the loan? (LO3)
3. The meal plan at University A lets students eat as much as they like for a fixed fee of \$500 per semester. The average student there eats 250 lb of food per semester. University B charges students \$500 for a book of meal tickets that entitles the student to eat 250 lb of food per semester. If the student eats more

than 250 lb, he or she pays extra; if the student eats less, he or she gets a refund. If students are rational, at which university will average food consumption be higher? (LO3)

4. You are planning a 1000-mile trip to Florida. Except for cost, you are indifferent between driving and taking the bus. Bus fare is \$260. The costs of operating your car during a typical 10,000-mile driving year are as follows: (LO3)

Insurance	\$1000
Interest	2000
Fuel & oil	1200
Tires	200
License & registration	50
Maintenance	<u>1100</u>
Total	\$5550

Should you drive or take the bus?

5. Al and Jane have rented a banquet hall to celebrate their wedding anniversary. Fifty people have already accepted their invitation. The caterers will charge \$5 per person for food and \$2 per person for drinks. The band will cost \$300 for the evening, and the hall costs \$200. Now Al and Jane are considering inviting 10 more people. By how much will these extra guests increase the cost of their party? (LO3)
6. You loan a friend \$1000, and at the end of 1 year she writes you a check for \$1000 to pay off this loan. If the annual interest rate on your savings account is 6 percent, what was your opportunity cost of making this loan? (LO3)
7. Bill and Joe live in Ithaca, New York. At 2 PM, Bill goes to the local Ticketmaster and buys a \$30 ticket to a basketball game to be played that night in Syracuse (50 miles north). Joe plans to attend the same game, but doesn't purchase his ticket in advance because he knows from experience that it is always possible to buy just as good a seat at the arena. At 4 PM, a heavy, unexpected snowstorm begins, making the prospect of the drive to Syracuse much less attractive than before. If both Bill and Joe have the same tastes and are rational, is one of them more likely to attend the game than the other? If so, say who and explain why. If not, explain why not. (LO3)
8. Two types of radar weather-detection devices are available for commercial passenger aircraft: the "state-of-the-art" machine and another that is significantly less costly, but also less effective. The Federal Aviation Administration (FAA) has hired you for advice on whether all passenger planes should be required to use the state-of-the-art machine. After careful study, your recommendation is to require the more expensive machine only in passenger aircraft with more than 200 seats. How would you justify such a recommendation to an FAA member who complains that all passengers have a right to the best weather-detecting radar currently available? (LO1)
9. A group has chartered a bus to New York City. The driver costs \$100, the bus costs \$500, and tolls will cost \$75. The driver's fee is nonrefundable, but the bus may be canceled a week in advance at a charge of only \$50. At \$18 per ticket, how many people must buy tickets so that the trip need not be canceled? (LO1)
10. Residents of your city are charged a fixed weekly fee of \$6 for refuse collection. They may put out as many cans as they wish. The average household puts out three cans per week.

Now, suppose your city changes to a “tag” system. Each can of refuse must have a tag affixed to it. The tags cost \$2 each.

What effect will the introduction of the tag system have on the total quantity of trash collected? (LO1)

11. Suppose that random access memory (RAM) can be added to your computer at a cost of \$8 per gigabyte. Suppose also that the value to you, measured in terms of your willingness to pay, of an additional gigabyte of memory is \$32 for the first gigabyte, and then falls by one-half for each additional gigabyte. Draw a graph of marginal cost and marginal benefit. How many gigabytes of memory should you purchase? (LO4)
12. Suppose in Problem 11 the cost of RAM falls to \$4 per gigabyte. How many gigabytes of memory should you purchase now? Suppose additionally that your benefit for an additional gigabyte of memory rises to \$144 for the first gigabyte, also falling by one-half for each additional gigabyte. How many gigabytes of memory should you purchase now, with both the lower price and the larger benefit? (LO4)
- 13\* Dana has purchased a \$40 ticket to a rock concert. On the day of the concert she is invited to a welcome-home party for a friend returning from abroad. She cannot attend both the concert and the party. If she had known about the party before buying the ticket, she would have chosen the party over the concert. *True or false:* It follows that if she is rational, she will go to the party anyway. Explain. (LO3)
- 14\* Yesterday you were unexpectedly given a free ticket to a Dave Matthews concert scheduled for April 1. The market price of this ticket is \$75, but the most you could sell it for is only \$50. Today you discover that Ani DiFranco will be giving a concert that same evening. Tickets for the Ani DiFranco concert are still available at \$75. Had you known before receiving your Dave Matthews ticket yesterday that Ani DiFranco would be coming, you definitely would have bought a ticket to see her, not Dave Matthews. *True or false:* From what we are told of your preferences, it follows that if you are a rational utility maximizer, you should attend the Ani DiFranco concert. Explain. (LO3)
- 15\* Mr. Smith recently faced a choice between being (a) an economics professor, which pays \$60,000/yr, or (b) a safari leader, which pays \$50,000/yr. After careful deliberation, Smith took the safari job, but it was a close call. “For a dollar more,” he said, “I’d have gone the other way.”

Now Smith’s brother-in-law approaches him with a business proposition. The terms are as follows:

- Smith must resign his safari job to work full-time in his brother-in-law’s business.
- Smith must give his brother-in-law an interest-free loan of \$100,000, which will be repaid in full if and when Smith leaves the business. (Smith currently has much more than \$100,000 in the bank.)
- The business will pay Smith a salary of \$70,000/yr. He will receive no other payment from the business.

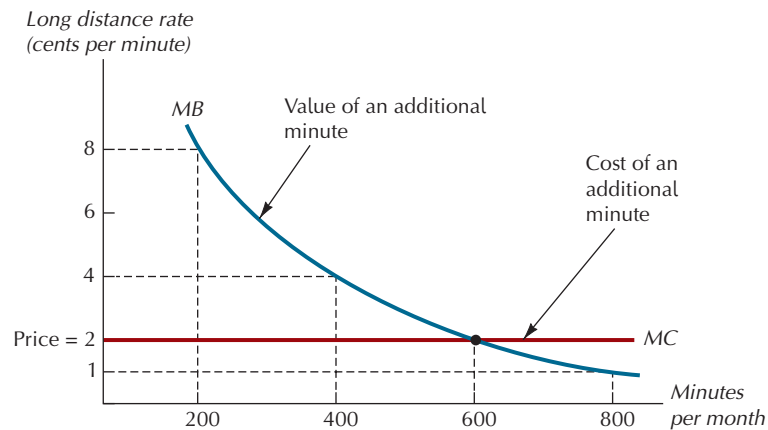
The interest rate is 10 percent per year. Apart from salary considerations, Smith feels that working in the business would be just as enjoyable as being an economics professor. For simplicity, assume there is no uncertainty regarding either Smith’s salary in the proposed business or the security of his monetary investment in it. Should Smith join his brother-in-law and, if so, how small would Smith’s salary from the business have to be to make it *not* worthwhile for him to join? If not, how large would Smith’s salary from the business have to be to make it worthwhile for him to join? (LO1, LO3)

\*Problems marked with an asterisk (\*) are more difficult.

16\* You have just purchased a new Ford Taurus for \$20,000, but the most you could get for it if you sold it privately is \$15,000. Now you learn that Toyota is offering its Camry, which normally sells for \$25,000, at a special sale price of \$20,000. If you had known before buying the Taurus that you could buy a Camry at the same price, you would have definitely chosen the Camry. *True or false:* From what we are told of your preferences, it follows that if you are a rational utility maximizer, you should definitely not sell the Taurus and buy the Camry. Explain. (LO1, LO3)

■ ANSWERS TO CONCEPT CHECKS ■

- 1.1 Someone who gets a \$28 traffic ticket every 200 miles driven will pay \$35 in fines, on the average, for every 250 miles driven. Adding that figure to the \$20 hassle cost of driving, and then adding the \$50 fuel, oil, and maintenance cost, we have \$105. This is more than the \$100 bus fare, which means taking the bus is best. (LO1)
- 1.2 The \$18 Mike paid for his ticket is a sunk cost at the moment he must decide whether to attend the concert. For both Jim and Mike, therefore, the costs and benefits should be the same. If the benefit of seeing the concert outweighs the cost of sitting in the rain, they should go. Otherwise they should stay home. (LO3)
- 1.3 You should use your coupon for the New Delhi trip, because it is more valuable to save \$120 than to save \$100 (LO1, LO3)
- 1.4 Two boats. Referring to Table 1.2, note that if marginal cost is \$150, it now pays to launch the second boat (marginal benefit = \$180) but not the third. (LO1, LO3)
- 1.5 At 2 cents per minute, Susan should talk for 600 minutes per month. (LO4)



\*Problems marked with an asterisk (\*) are more difficult.